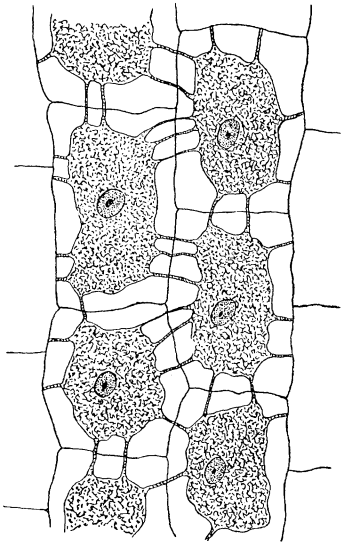
BRIEFER ARTICLES.

Continuity of protoplasm.—In demonstrating this very important fact, Strasburger[1] directs the use of the strongest objectives, and, where possible, immersion objectives. This at once puts it out of the reach of many laboratories, where the teacher is thankful if he gets enough ordinary objectives. The information, therefore, that protoplasmic continuity can be easily demonstrated, with very little manipulation and very ordinary objectives, ought to be helpful to many. The most favorable object used is the secondary cortex or "green bark" of dicotyledons. Strasburger suggests the buckthorn, Rhamnus Frangula; Goodale mentions any "dicotyledonous shrub or tree." In most of these cases the connecting fibrils are so delicate that the highest objectives are neccessary to demonstrate them. But in the common buckeye the strands which connect the plasmic bodies are so large as to be satisfactorily seen with a magnification of 250 diameters, and very well studied with a magnification of 500 diameters, and in neither case is there any necessity of using an immersion objective. To repeat very briefly the method of preparing the specimen, and omitting all details that were found unnecessary, it is as follows: Use a buckeye twig about $\frac{1}{4}$ to $\frac{1}{2}$ inch in diameter (those a year or two old seem best); carefully slice off the periderm so as to expose the "green bark"; make a thin tangential section from this latter; immerse this in an aqueous solution of iodine (or, better, iodine in a solution of potassic iodide) until it turns brown, which will take but a moment; wash the section thoroughly to remove excess of iodine; mount in water; at the edge of cover slip put a drop of chemically pure sulphuric acid and two drops of dilute (about 75 per cent.) sulphuric acid, and draw this mixture under[2]; thoroughly wash the specimen by drawing plenty of water through (this is very important); replace the water of the mount with glycerine and the specimen is ready to observe. If the work has been successfully done, even a low power will reveal the very much swollen and transparent walls crossed in every direction by proto-



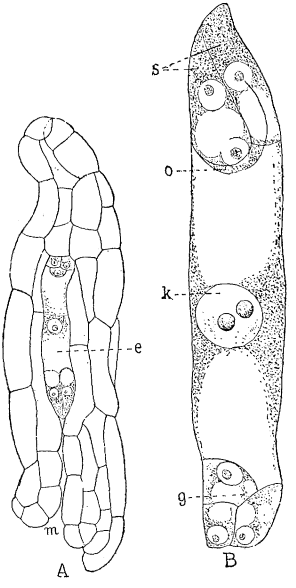
Continuity of protoplasm in secondary cortex of buckeye.

[1]Practical Botany, Hillhouse translation, p. 370; Hervey translation, p. 364; described in Goodale's Physiol. Bot., p. 216.

[2]It may be easier to dip the section directly into the sulphuric acid and then wash thoroughly.

plasmic strands connecting the contracted brown plasmic bodies as shown in the accompanying cut. To make a permanent mount, it will be necessary to use some stain for the plasmic bodies and their connecting strands; otherwise the strands gradually become so transparent in the glycerine as to be almost invisible. The ease of demonstration in case of the buckeye, as compared with other dicotyledons previously used, depends upon the fact that the plasmic protuberances do not break up into delicate fibrils on entering the walls. This demonstration was made by Mr. Evans, my assistant, and the sketch by Mr. Seaton, a special student. —JOHN M. COULTER, *Botanical Laboratory, Wabash College.*

Monotropa uniflora as a subject for demonstrating the embryo-sac.— In the "Botanisches Practicum,"[1] Strasburger figures the embryo-sac of Monotropa Hypopitys as the most favorable plant known to him for its study in the living state.



A. Ovule of Monotropa uniflora in optical section, X about 100: *m*, micropyle; *e*, embryo sac. B. The embryo-sac of a similar ovule, X about 300: *s*, synergidæ; *o*, oosphere; *k*, endosperm nucleus (the two endosperm nuclei have united, but their nuclei are still distinct); *g*, antipodal cells.

I have found M. uniflora to be even better suited to this purpose owing to the greater size of the ovules and embryo-sac, the latter being just about twice as long as that of the former species, and showing quite as clearly all the details of its structure.

It is only necessary to strip away a little piece of the placenta with the adherent ovules and mount in water, or, better still, a weak (about 3 per cent.) sugar solution. In the latter fluid the ovules remain unchanged for several hours, and may be studied at leisure.

The embryo-sac is covered with but two layers or cells, and these are perfectly colorless, so as not to interfere in the slightest with the view of the embyro-sac.

M. uniflora is not at all a rare plant and may usually be had throughout the summer. The specimen from which the accompanying figures were made was collected at Bloomington, Sept. 24.

The figures are from camera drawings and will give a good idea of the structure of the ovule and embryo-sac.—DOUGLAS H. CAMPBELL, *Bloomington, Ind.*

[1] Hillhouse's translation, p. 331.